CSE 4321/5321

Homework 2

Spring 2020

Problem 1, 2 and 5 are 25 percent credit each. Problems 3-4 are 12.5 percent credit each. 100 percent total.

**Problem 1.**

Use Problem 6 from HW 1 to develop the following.

**Submit the following for this problem:**

1. The test case table - start with this first. It will be very helpful to develop the state table first. Do this from the diagram.
2. Sequence enumeration table
3. List the canonical states - in your pdf or word solution, not the table

Test Case Table

The format of the test case table is the following:



1. States are numbered S0 ... SN.
2. Show Boolean inputs and outputs as T or F
3. Show the Display as the text message without the double quote delimiters
4. For State S2 you only need to specify valid combinations not all 32 combinations

Sequence enumeration table.

1. Use sequence enumeration to develop the canonical states. Show all sequences from length 0 to N. Note that I have pre-filled in the Length 0 response for you below.
2. Capture these in the attached table
3. For the "**Carry to next level**" column in the spreadsheet - use "Yes" or leave blank (for no).
4. Show all outputs for each - there will be no null responses
5. Mark each non-equivalence with a "-" enter in Excel as '-



**Problem 2.**

From Problem 2 of HW 1 we need to develop a method that computes the ticket fare.

Your method has the inputs of:

1. LDT (e.g. 12:00:00 " am")
2. Day type (weekday, weekend , or Holiday)
3. Discount type

Fare (expected output) = Base Fare cost per ticket \* Rate Mult Factor \* (1-discount amount).

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Base Fare** | | **Rate Mult** | | **Discount** | |
| **Volume** | **Cost/ticket** | **Day Type** | **Factor** | **Type** | **Amount** |
| Low Volume | $2.75 | Weekday | 1 | Standard | 0 |
| High Volume | $3.75 | Weekend | 0.8 | Student | 5% |
|  |  | Holiday | 1.5 | Senior | 10% |
|  |  |  |  | Veteran | 12.50% |
|  |  |  |  | Teacher | 8% |
|  |  |  |  | Worker | 50% |

Fare is a double truncated to the cent (represents currency), make sure to truncate each calculation. Because of the boundary values in the LDT (from Problem 1), the boss wants you to test all the boundary values of LDT as follows:



The boss does not want you to test all 180 possible combinations of unit test parameters. She has given you a challenge to reduce the number of tests <= 60 because she has a tight test budget.

Your test case table is as follows.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Test Case** | **Inputs** | | | **Exp Output** |
| **LDT** | **Day type** | **Discount type** | **Fare** |

Instructions

1. Download the allpairs tool from the following site <http://www.satisfice.com/tools/pairs.zip> and follow the instructions.
2. Use the previous table (test case table) to develop the test cases needed to test all pairs.
3. Supply item 2 as a single test case table in Excel. You do NOT need to show the output of the allpairs tool - just the test cases it generates and in the order it provides.

**PLEASE MAKE SURE TO SAVE A COPY OF THE TEST CASE TABLE ABOVE AS A TAB DELIMITED TXT FILE. In Excel -> Save As... -> tab delimited txt file. This will allow the GTAs to use WinMerge to compare your test case table with the output. 50% deduction if not supplied.**

**Also, please make sure to show the enumeration values {cash, credit, debit} and not their actual values {-0.3%,0.3%,0.0%}**

**Problem 3.**

Minimize the following expressions using a K-map. Show all work including the K-map.

1. a'bd' + a'c'd+ ac'd + a'cd'
2. a’b’c'd' + ab’c’d + ab’cd + a’bcd + abc'd+ abcd
3. a'b' + a'bc'd + ac'd'
4. abc'd + a'b'c'd' + ab'c'd' + abc'd' + a'bc'd + ab'c'd + a'bc'd'
5. a’b’c’d' + ab’c’d' + ab’cd' + a'b'cd' + abc'd'+ a'b'c'd

**Problem 4**

For each of the following expressions develop the terms below. Make sure to reduce each to the minimum logical expression before solving. Reduce all answers also.

1. a'b + c'
2. a'(b + c')
3. a + b'c + d
4. (ab XOR cd) + abcd
5. The condition coverage, decision coverage, condition/decision coverage terms (one pair per coverage). Write solutions in terms of n-tuples - (FFF, FFT) as appropriate. Clearly indicate your answers for each. **FOR DECISION COVERAGE USE THE FIRST TERM AS FFF or FFFF**
6. The TOFs (Term Omission Faults) and TNFs (Term Negation Faults) for each. Separate each possible answer by a comma.

**Problem 5**

1) Use MC/DC logic and BV testing to determine the minimum test cases for each of the following requirements expressions. For each part, develop a test case table showing test case number, inputs, and expected outputs using the table as shown below.

1. a = (b < 10) || c'
2. a = b' || (c>=4)
3. a = (b <=8) & (c>8)
4. a = (b>=2) & (b<8)

Express inputs in terms of numbers (for conditions with logical operators) and Booleans (for logical conditions) - e.g. the inputs are b (int) and/or c (int) when integer expressions are used, otherwise the inputs are Boolean.

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Inputs** | | **Expected Outputs** |
| **Test Case** | **b** | **c** | **a** |
| 1 |  |  |  |
| 2 |  |  |  |
| 3 |  |  |  |

2) Provide the UC MCDC solution for each expression (only 1 solution is needed for each).

1. a'b + c
2. a'(c + d')
3. a + b'c + d
4. (ab XOR cd) + abcd

3) Develop the MC/DC solutions for the following expression - 2 UC solutions and 1 Masking solution (that is not a UC solution). Show which are Masking and which are Unique Cause. ab'c + d'